Karyab et al. Journal of Environmental Health Sciences & Engineering 2013, 11:25
http://www.ijehse.com/content/11/1/25

JOURNAL OF ENVIRONMENTAL HEALTH SCIENCE & ENGINEERING

RESEARCH ARTICLE Open Access

Polycyclic Aromatic Hydrocarbons in drinking water of Tehran, Iran

Hamid Karyab[1], Masud Yunesian[1,3*], Simin Nasseri[1,2], Amir Hosein Mahvi[1,2], Reza Ahmadkhaniha[4], Noushin Rastkari[3] and Ramin Nabizadeh[1]

Abstract

Distribution and seasonal variation of sixteen priority polycyclic aromatic hydrocarbons (PAHs) were investigated in the drinking water of Tehran, the capital of Iran. Detected single and total PAHs concentrations were in the range of 2.01-38.96 and 32.45-733.10 ng/L, respectively, which were quite high compared to the values recorded in other areas of the world. The average occurrence of PAHs with high molecular weights was 79.55%; for example, chrysene occurred in 60.6% of the samples, with a maximum concentration of 438.96 ng/L. In addition, mean carcinogen to non-carcinogen PAHs ratio was 63.84. Although the concentration of benzo[a]pyrene, as an indicator of water pollution to PAHs, was lower than the guideline value proposed by World Health Organization (WHO) as well as that of Iranian National Drinking Water Standards for all of the samples, the obtained results indicated that carcinogen PAHs present in the drinking water of Tehran can cause threats to human health.

Keywords: Polycyclic aromatic hydrocarbons, Drinking water, Tehran

Introduction

Drinking water is one of the oldest public health issues and is associated with a multitude of health-related concerns. These concerns are derived into microbial and chemical pollutants, which are comprehensively presented in the international guidelines for drinking water quality [1]. Because of their adverse effects on human and the environment, chemical pollutants, especially xenobiotic compounds, are of foremost importance. The presence of organic pollutants, including endocrine disruptors, organophosphorous pesticides, disinfection by-product precursors, trihalomethanes (THMs), and trichloroethylene (TCE) in water resources have been widely investigated by a large number of studies [2-5]. Polycyclic aromatic hydrocarbons (PAHs) are a group of xenobiotic chemicals which are made up of carbon and hydrogen. They represent a group of contaminants with high melting and boiling points, low vapor pressure, and very low water solubility [6,7]. In the environment, they are mostly derived from anthropogenic activities. However, they can also be released into the environment through natural incomplete combustion [8]. PAHs are ubiquitous in the environment, which can be frequently found in food [9], air [10], soil [11], and sediments [12]. Additionally, they can be detected in street dust [13], rain water [14], and urban runoffs [15]. PAHs can reach water bodies mainly through dry and wet deposition, road runoff, industrial wastewater, leaching from creosote-impregnated wood, petroleum spills, and fossil fuel combustion [16-19]. They are generally teratogenic, carcinogenic, and mutagenic and may induce lung, bladder, as well as skin cancer. In addition, exposure to high levels of PAHs has been shown to produce immunosuppressive effects and is capable of causing oxidative stress during its metabolism [20-22]. The main objective of the present study was to investigate the distribution and seasonal variation of sixteen PAHs, as priority pollutants recognized by U.S. Environmental Protection Agency (EPA), in the drinking water of Tehran, the capital of Iran.

Materials and methods

Based on drinking water supply, Tehran was divided into six districts. Four water samples were collected from each district in each season over the period from July 2011 to May 2012 (i.e. a total of 99 samples). In order to prevent

* Correspondence: yunesian@tums.ac.ir
[1]Department of Environmental Health Engineering, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[3]Center for Air Pollution Research, Institute for Environmental Research, Tehran University of Medical Sciences, Tehran, Iran
Full list of author information is available at the end of the article